Space Weather Forecast

Issued on Saturday, 18 March 2023 at 00:46 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Several large possible Coronal Mass Ejection (CME) events observed - analyses pending.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity rose to moderate over the past 24 hours, with X-ray flares peaking at a low-end Moderate-class at 17/1507UTC. This peak comprised of an impulsive flare from a sunspot group in the southwest, overlaid on a much longer-period but smaller magnitude common-class flare from a larger sunspot region in the southeast.

In terms of sunspot groups, there has been a reduction in the front-side population in the past 24 hours, with just three surviving groups.

Solar activity has been dominated by 'filament eruptions' (arcs of plasma potentially leaving the Sun as CMEs) in the period - most notably a 30-degree longitude spanning filament leaving the southwest at 17/1100UTC, angled largely ahead and below of the Sun-Earth line. A pair of smaller filaments then lifted off the northwest at 17/1800UTC and 17/2100UTC, capped by a much larger eruption in advance of the southwestern sunspot group at 17/2200UTC.

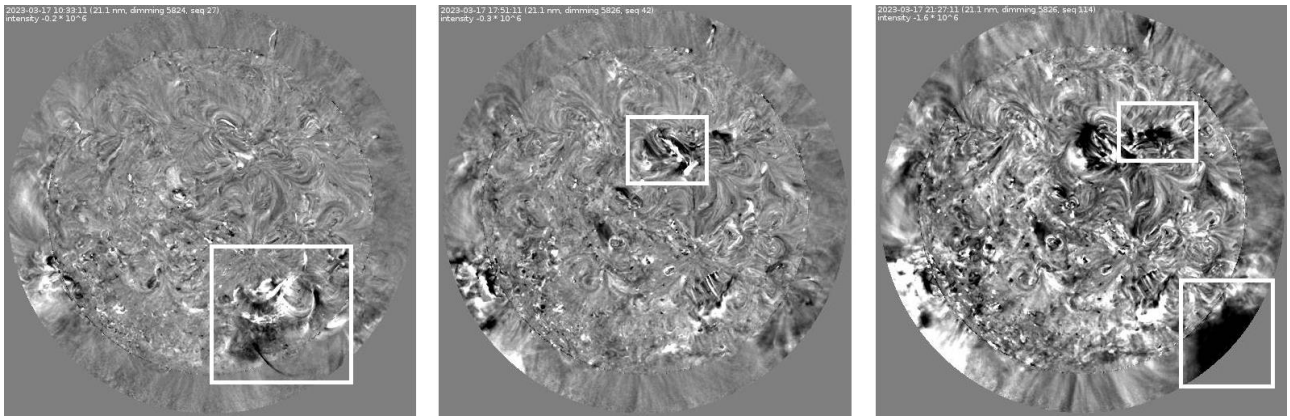

Figure 1: non-exhaustive rogues' gallery of time-integrated extreme UV imagery, showing at least four front-sided 'filament lift offs'. Only the leftmost has so far been accounted for and analysed. Image processing courtesy of SIDC ROB.

At the time of writing only the first of these filaments has been analysed, with the result being a miss ahead of and below the track of the Earth's orbit. Keeping abreast of the forecast is advisable for the remainder, with Earth-directed components considered a possibility for both the northwestern lift-offs, should imagery confirm that they have indeed left the immediate solar environment. The geomagnetic forecast is therefore of lower than average confidence in the meantime.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

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Solar Wind / Geomagnetic Activity: The solar wind showed a decline through slightly elevated levels, which may be the death throes of a fast wind regime ongoing since 15 March.

The number of particles in the solar wind was level within its typical range, while the magnetic field associated with these particles was stable at background levels, with the north-south component not spending protracted periods either co or anti-aligned with Earth's field.

The net result of the above solar wind measures was for provisionally quiet geomagnetic actvity throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed, with levels continuing to relax towards an unperturbed background after the 13 March S1 Minor Solar Radiation Storm.

Four-Day Space Weather Forecast Summary

Solar Activity: There is a daily chance of Moderate-class X-ray activity, primarily from the largest sunspot group near the southeastern solar horizon, which is likely to be hiding detail given the narrow viewing angle. This risk may be bolstered by further sunspot arrivals that are due in the four days.

Solar Wind / Geomagnetic Activity: No CMEs currently feature in this forecast, although note the 'Solar Activity' section and some unanalysed candidates. The geomagnetic forecast is therefore of lower-than-average confidence pending imagery.

The geomagnetic forecast currently comprises the onset of one fast wind regime, with this feature mooted for arrival on Monday 20 March. There is a peak slight chance of Minor Geomagnetic Storm G1 for the four-day period on this day, with preceding and following activity largely quiet.

Energetic Particles / Solar Radiation: No solar radiation storms are expected. Causative proton flux is expected to continue its current gradual decline towards a quiet background level, with a very slightly raised residual risk until this is completed - perhaps by the end of the current UTC weekend.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	25	25	25	25
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	5	5	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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